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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/647,714	08/25/2003	Muhammad Asif Khan	SETI-0002DIV	2476
7590	07/14/2004		EXAMINER	
Hoffman, Warnick & D'Alessandro LLC Three E-Comm Square Albany, NY 12207			LE, THAO P	
			ART UNIT	PAPER NUMBER
			2818	

DATE MAILED: 07/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/647,714

Applicant(s)

KHAN ET AL.

Examiner

Thao P. Le

Art Unit

2818

-- **Th MAILING DATE of this communication appears on the cover sheet with the correspondenc address --**  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 25 May 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-14 and 24-31 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-14 and 24-31 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 8/25/03 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date: \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

DETAILED ACTION

1. Claims 1-14 and 24-31 are pending.

**Claim Rejections**

***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-3, 6, 7, 9, 10-13, 24, 30-31 are rejected under 35 U.S.C. 102(b) as being anticipated by Kawai et al., U.S. Patent No. 5,929,467.

Regarding to claims 1 and 10, Kawai et al. discloses a method of forming nitride based structure (See Figs. 1-7 and Cols. 1-14) comprising:

- . providing a substrate 1 (claims 1, 10);
- . applying a first layer over a substrate wherein the first layer includes nitrogen (layer 2, GaN, lines 10-11, Col. 4) (claims 1, 10) and includes gallium (claim 10).
- . applying a dielectric layer 4 over the first layer wherein the dielectric layer includes silicon dioxide (barrier layer, AlN or SiO<sub>2</sub>; lines 44-56, Col. 4) (claims 1, 10);
- . applying a first contact 7 (Fig. 1) disposed above and adjoining to the dielectric layer 4 (claims 1, 10).

Regarding to claims 2 and 11, Kawai et al. discloses the claimed limitations as applied in claims 1 and 10 above and further discloses the substrate is sapphire (line 64, Col. 3).

Regarding to claim 3, Kawai et al. discloses the claimed limitations as applied in claim 1 above and further discloses the first layer includes a binary compound including one element of the group consisting group III elements (GaN, lines 10-11, Col. 4).

Regarding to claim 6, Kawai et al. discloses the limitations as applied in claim 1 and further discloses the step of forming a second layer 9 (Fig. 7) between the first layer 2 and the dielectric layer 4 wherein the second layer includes nitrogen (AlGa<sub>N</sub>, lines 22-23, Col. 7).

Regarding to claim 7, Kawai et al. discloses the limitations as applied in claims 1 and 6 and further discloses wherein the first layer 2 including a binary compound including one element of the group III (Ga<sub>N</sub>) and the second layer 9 includes a ternary compound including two element of group III (AlGa<sub>N</sub>, lines 22-23, Col. 7).

Regarding to claim 9, Kawai et al. discloses the limitations as applied in claim 1 and further discloses the step of applying a source contact and a drain contact (5,6, Fig. 1) to the first layer; and wherein the first contact 7 comprises a gate contact (lines 3-4, Col. 4).

Regarding to claim 24, Kawai et al. discloses the limitations as applied in claims 1 and 9 above, Kawai further discloses wherein the dielectric layer 14 contacts the source contact and the drain contact (Fig. 1).

Regarding to claim 12, Kawai et al. discloses the claimed limitations as applied for claim 10 above and further discloses applying a second layer 9 (Fig. 7) between the first layer and the dielectric layer wherein the second layer includes Al, Ga, and N (AlGaIn, lines 22-23, Col. 7).

Regarding to claim 13, Kawai et al. discloses the claimed limitations as applied for claims 10 and 12 above and further discloses wherein the substrate 1 comprises sapphire (line 64, Col. 3).

Regarding to claim 30, Kawai et al. discloses the claimed limitations as applied in claims 1 and 6 above, Kawai et al. discloses wherein the second layer adjoins the first layer 2 and the dielectric layer 4 (Fig. 7)

Regarding to claim 31, Kawai et al. discloses the claimed limitations as applied in claims 10 and 12 above, Kawai et al. discloses wherein the second layer adjoins the first layer 2 and the dielectric layer 4 (Fig. 7).

#### **Claim Rejections - 35 USC § 103**

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 4-5, 8, 14, 25-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawai et al., U.S. Patent No. 5,929,467, and in view of Sheppard et al., U.S. Patent No. 6,486,502.

Regarding to claims 4-5, Kawai et al. discloses the claimed limitations as applied for claim 1 above but fails to disclose wherein the first layer further includes a ternary compound including two elements of group III elements (claim 4) or includes a quaternary compound including three elements of group III element (claim 5). Sheppard et al. discloses a method of forming nitride based structure wherein the first layer further includes a ternary compound including two elements of group III elements (AlGa<sub>2</sub>N, line 56, Col. 3) or includes a quaternary compound including three elements of group III element (AlInGa<sub>2</sub>N, line 60, Col. 3) (lines 34-40, Col. 4).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use either binary compound, ternary compound, or quaternary compound including one, two, or three elements of group III elements because when group III elements combine with nitrogen to form binary, ternary, or quaternary

compounds, these compounds all have empirical formulas in which one mole of nitrogen is combined with a total of one mole of the group III elements. In addition, the elements in the same group have similar physical and chemical properties. Therefore, the compounds of binary, ternary, or quaternary would carry out similar functions and manners and the device would yield a similar result, would have the same advantageous properties and characteristics (lines 35-40, Col. 4).

Regarding to claim 8, Kawai et al. discloses the claimed limitations as applied in claims 1 and 6 above but fails to disclose wherein the first layer includes a ternary compound including two elements of group III and the second layer further includes a quaternary compound including three elements of group III.

Sheppard et al. discloses a method of forming nitride based structure wherein the first layer further includes a ternary compound including two elements of group III elements (AlGa<sub>N</sub>, line 56, Col. 3) and the second layer could be formed of either ternary or quaternary (AlInGa<sub>N</sub>, line 60, Col. 3) (lines 34-40, Col. 4).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to form either binary compound, ternary compound, or quaternary compound including one, two, or three elements of group III elements because when group III elements combine with nitrogen to form binary, ternary, or quaternary compounds, these compounds all have empirical formulas in which one mole of nitrogen is combined with a total of one mole of the group III elements. In addition, the elements in the same group have similar physical and chemical properties. Therefore,

the compounds of binary, ternary, or quaternary would carry out similar functions and manners and the device would yield a similar result and have the same advantageous properties and characteristics (lines 35-40, Col. 4).

Regarding to claim 14, Kawai et al. discloses the claimed limitations as applied in claims 10 and 12 and further discloses the first layer includes Ga and the second layer includes indium (lines 11-15, Col. 8) but fails to disclose the first layer includes Al. Sheppard et al. discloses the first layer includes Al (lines 28-40, Col.4). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use either Al or Ga because Kawai et al. and Sheppard et al. disclose elements of group III are used and because both Al and Ga are in group III elements, having similar physical and chemical properties, thus, yielding similar characteristics, manners, and band gap.

Regarding to claim 25, Kawai et al. discloses a method of forming nitride based structure (See Figs. 1-7 and Cols. 1-14) comprising:

- . providing a substrate 1;
- . applying a buffer layer 2 on the substrate, the buffer layer includes gallium and nitrogen;
- . applying an active layer 9 on the buffer layer, the active layer includes gallium and nitrogen (AlGa<sub>2</sub>N, line 23, Col. 7; Fig. 7);

- . applying a barrier layer 3 on the active layer wherein the barrier layer includes gallium and nitrogen;
- . applying a dielectric layer 4 over the first layer wherein the dielectric layer includes silicon dioxide (barrier layer, AlN or SiO<sub>2</sub>; lines 44-56, Col. 4) (claims 1, 10);
- . applying a first contact 7 (Fig. 1) disposed on the dielectric layer 4 (claims 1, 10).

Kawai et al. discloses the buffer layer and the barrier layer include gallium (Ga) but fails to disclose the buffer layer and the barrier layer include aluminum (Al). Sheppard et al. discloses a method of forming nitride based structure including a buffer layer 12 and a barrier layer 14 wherein the buffer layer and the barrier layer include aluminum (Fig. 1). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use either Al or Ga because Kawai et al. and Sheppard et al. disclose elements of group III are used and because both Al and Ga are in group III elements, having similar physical and chemical properties, thus, yielding similar band gap, characteristics and manners.

Regarding to claim 26, Kawai et al. discloses wherein at least a portion of barrier layer 3 remains uncovered by the dielectric layer 4 (Fig. 7).

Regarding to claims 27-28, Kawai et al. discloses wherein the method in claim 25 further including the steps of applying a source contact 5 on the barrier layer, applying a drain contact 6 on the barrier layer, wherein the first contact on the dielectric layer 4 comprises a gate contact, and wherein the dielectric layer further contacts the source contact and drain contact (Figs. 1, 7).

Regarding to claim 29, Kawai et al. discloses the active layer comprises an insulating layer 9 and an n-type layer 23a on the insulating layer (lines 10-15, Col. 8; Fig. 9).

6. When responding to the office action, Applicants' are advice to provide the examiner with the line numbers and page numbers in the application and/or references cited to assist the examiner to locate the appropriate paragraphs.

A shortened statutory period for response to this action is set to expire 3 (three) months and 0 (zero) day from the day of this letter. Failure to respond within the period for response will cause the application to become abandoned (see M.P.E.P 710.02(b)).

### ***Conclusion***

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thao P. Le whose telephone number is 571-272-1785. The examiner can normally be reached on M-T (7-6).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on 571-272-1787. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'Thao P. Le'.

Thao P. Le  
Examiner  
Art Unit 2818